DETAILED RESPONSE TO FIRST OFFICE ACTION on 10/619,255

Reconsideration of the office action is respectfully requested on the basis of the following opinions and revised claims.

Specification

1) Unintentionally broad scope of claim 1 has been narrowed to be described in the description. A single fiber is required in a system.

Drawings

2) Drawings do not require amendment in light of changes in item 1.

Claim Rejections

3) This invention is non-obvious, as further explained below.

4) As for the rejection of **claim 1,**

Hodge does efficiently report a numerical displacement for early warning of structural changes, but does not guarantee or efficiently report a sudden collapse. Furthermore, Hodge requires a large number of components to function, complexity is inversely proportional to reliability.

Marshall reports no more than the minimum required data for collapse detection, providing no early warning information, taking advantage of efficiency and reliability of fewer components and taking advantage of a system capable of being used and maintained by field personnel with no more than a high school education. Early warning based on structural movement is of no benefit if the collapse is due to collision with a barge.

A number of bridge collapse detection systems have been deployed, operated for a few years, had a failure of the collapse detection system hardware, the field personnel were unable to revive the system, the state didn't want to pay for a skilled person to fly in to fix the system, so the system was simply abandoned. Simplicity and reliability are key to a real world system.

Hodge's tensioner / sensor assemblies do contain pulleys. These pulleys are intended to keep the cable taught, allowing the cable to rotate through the pulleys, and thus maintain accurate displacement measurement. Hodge's pulleys are not analogous since these

pulleys are not intended to prevent the cable from moving past the pulleys and break the cable in the event of a catastrophic structural failure as disclosed in Marshall.

Hodge may assume a collapse has occurred measuring a displacement greater than a selected limit. However, a collapse can be a quick event, unlike slow position shifts. With an encoder with 3 or more bits, as shown in Hodge's Fig 11-13, polling the displacement every second could misinterpret the collapse event as a change from a valid position code to an invalid position code, such as a broken fiber or transceiver. With an encoder as shown in Hodge's Fig 6-10, if the current position is a '0' and an encoder ripped from the system by a collapsing structure is '0', polling these two states would indicate no structural collapse. This system is not guaranteed to always report a collapse.

Hodge, describes a signal source, a signal detector, a Y coupler, a signal pulse, and a plurality of cables. The signal source and signal detector are at the same end of the cable, and a pulse is sent down the cable and a reflection is either detected or not detected. Marshall specifies the signal source and detector are at opposite ends of the cable, the system requires a singular cable (unless redundant systems are installed), and the source does not require any pulses. It may be a steady state source. The preferred embodiment does include pulses such that a microcontroller may send a serial data byte and receive that same byte back.

As for the rejection of **claim 2**, Hodge also uses fiber optic cables, but not as an element intended to fail under tensile load.

As for the rejection of **claim 3**, stretching is essential to measure slight displacements in Hodge. However, this is not considered obvious in light of Schmidt and State of Texas "Collapse Detection and Warning System", sheet 40, "small" condulet details, where the fiber will simply pass around the nylon screw with sleeve under long term tension less than the breaking point of the fiber. The each fiber within the cable can withstand approximately 40 lbs of tension without breaking.

As for the rejection of **claim 4**, Hodge discloses a spindle set in Figure 19. Hodge's spindle set is operable to tension a cable and specifically allows the cable to slip around the spindles. Hodge's spindle set is not operable to anchor the cable to prevent slippage around the spindles.

For clarification, claim 4 has been combined with claim 1. A new claim 4 has been inserted claiming a data signal. The system will fully function if the signal source is always on, and not modulated with any data.

As for the rejection of **claims 5-7**, no prior art has been sited these features as providing the best results.

As for the rejection of **claims 10 and 11**, Hodge does disclose multiple sensor assemblies placed in series to cover the entire length of a bridge. The length of a Hodge system is limited by the amount of friction with the cable support features and the stretch of the

cable determining the minimum detectable displacement. At some point, the detectable displacement will become greater than the displacement of a collapsed bridge span. A Hodge system installed on a low elevation two mile causeway, such as the Queen Isabella causeway described in State of Texas, would require: 8 systems connected in series; expensive hardened electronics located midspan over salt water; the electronics are the low reliability component in the system, yet would be in a difficult to access and not for the faint of heart location, hanging on the bottom side of the bridge; dramatically increased cost to install and maintain such a system.

The distance between Marshall cable anchors (spindle sets) is approximately equal to the length of the Hodge system. The Marshall system can have multiple cable anchors on a single fiber optic cable. The maximum length of the Marshall system is limited only by the distance data can travel on a fiber optic cable, which is easily 30k ft with low cost fiber optic sources and detectors. All electronics (less red traffic lights) are located on shore.

Although Hodge used multiple fibers, all of the fibers are required for functioning of a single system. In Marshall, a system only requires 1 fiber, and a fully redundant system requires 2 fibers.

5) The above opinion of Marshall indicates that Hodge presents a system monitoring the distance between 2 points, whereas Marshall presents a unique and novel system to detect a structure collapse.

As for the rejection of **claim 9**, it is agreed that State of Texas discloses a signal detector, flashing lights, and railroad gate.

As for the rejection of **claims 12-15**, it is agreed that State of Texas discloses diagnostics, UPS, and emergency notification.

6) Marshall claims priority to provisional application number 60/399,197, "System and Method for Detecting a Bridge Failure", dated July 29, 2002. This predates State of Texas, dated January 7, 2003. More specifically, State of Texas Department of Transportation (TxDOT) desired to install a collapse detection system on the Queen Isabella Causeway after the structure failed due to a collision by a barge, resulting in several deaths. TxDOT envisioned a collapse detection system, attaching a fiber optic cable to a structure such that a cable break would indicate a structure collapse. However, TxDOT was unable to attach their gel filled fiber optic cable to the bridge in a manner that would guarantee the fiber break, yet not falsely break under normal operating conditions. The gel filled cable would simply slip past the attachment point for a significant distance before finally getting caught and broken. When the cable would finally get caught and broken was not a controllable parameter. This causeway is primarily a low elevation structure in very shallow water in the Gulf of Mexico. So, a dropped span would not fall very far, unless the collapse occurred in the high elevation

shipping channel area. The system without a way to prevent the cable from slipping was useless.

TxDOT made Marshall et al, aware of the problem. Marshall disclosed a system and method to detect a failure based on a cable that wouldn't slip. This involved a dry buffer cable, which still significantly slips within a sheath containing aramid yarn, and by spindling the cable in the stated fashion. Without the stated winding, the spindle would simply rotate and still allow the cable to slip.

The "small" condulet details disclosed in TxDOT "Collapse Detection and Warning System", sheet 40, is prior art, entirely the disclosure of TxDOT. The "breaker" condulet details on the same page shows the invention by Marshall, and is not prior art. This was incorrectly disclosed on the accompanying IDS. This IDS disclosure is the result of the first offer for sale of this invention.

As for the rejection of **claim 16**, although Marshall does not feel it necessary to narrow the scope of this claim, the scope has been narrowed to cover a small controller fit into the traffic signal head.

As for the rejection of **claims 17-18**, it although Marshall does not feel it necessary to narrow the scope of this claim, the scope has been narrowed to cover a small energy storage device fit into the controller fit into the traffic signal head and narrowed to allow diagnostic commands to be specific to a single traffic signal.

As for the rejection of **claims 29-30**, claim 29 has been narrowed to include a spindle means.

7) As for the rejection of **claim 19**, Hodge teaches a means to measure displacements over a small number of spans, including the use of an inclinometer. It is not obvious to combine an inclinometer within an off the shelf controller. One would place the inclinometer on the structure and run wire to a separate controller located on shore. With a custom controller specified by Marshall, an inclinometer integrated into a controller is readily achievable.

State of Texas uses a PLC controller cabinet, specifically limited by design to 2 controller cabinets, one on each shore due to the high cost of ~$40k each. One would not want to put such a controller on each of about 130 spans, increasing the system cost by a factor of 5 times.

8) As for the rejection of **claims 20-33**, State of Texas does disclose a means for anchoring the cable to the structure on sheet 40, "breaker" condulet details. As explained above, this section is not prior art and is claimed in the related Marshall provisional application. The State of Texas system would not be able to prevent cable slippage without this "breaker" condulet. Without a means to control cable slippage, the fiber

optic cable is not attached to the structure such that a cable failure indicates structure failure. A structure failure could simply stretch the cable and not fail without an anchor point. Please note that although glass is not very stretchable, a communications fiber cable consists of bundle of multiple glass fibers, in a plastic buffer, twisted together. Pulling on the fibers will cause some lengthening due to untwisting and compression of the plastic buffer. This bundle of fibers is wrapped in aramid yarn and then placed within an outer plastic jacket. The aramid yard is very slippery and allows movement of the fiber bundle. Also, please note that fiber optic communications cables are specifically designed to withstand environmental abuse, such as some stretching, without breaking. This is the exact opposite design as would be desired in a collapse detection system. However, it is not economical to custom design and build a cable for this application.

Schmidt does disclose a means for attaching a cable to a structure such that a metallic cable will not slip or creep past an attachment point. Metallic cables are ductile and thus can easily be drawn into a longer cable with smaller wire diameter. Metallic cables are undesirable due to their ability to conduct lightning, a serious concern on bridges spanning different electric utility substations.

If the Schmidt anchoring means were applied to a fiber optic cable, the fiber would either: simply slip within the aramid yarn if the nut were tight enough to grip the cable sheath; or be crushed if the nut were tight enough to grip the fibers. Furthermore, in the unlikely event that the fibers were not crushed, the high pressure on the sheath would put many tight bends in the fiber. It is well known that tight bends increase insertion loss and that a multitude of tight bends can increase insertion loss to the point where the signal cannot pass. If the anchoring means were applied to a single buffered fiber, the fiber would either: slip through the hole, if the nut were slightly loose; or be crushed, if the nut were slightly tight. It is doubtful if there is a correct torque at all, as the nut must dig into the fiber buffer enough to grip, wet not crush the glass fiber. The anchoring means in Schmidt simply doesn't work for fiber.

As for the rejection of **claims 21 and 34**, these claims specify how well the anchor grabs the cable, I.E. how much cable a falling span can drag past the anchor point without breaking the cable. This is important in minimizing the number of anchor points required with a slightly elastic cable and limited fall distance. As noted above, the Schmidt anchor cannot control the slip past the anchor point for a fiber optic cable. Also, as an example, the State of Texas "small" condulet detailed on page 40, one may easily take tens of feet of fiber optic cable on both sides of the condulet and extract a single fiber without damage to the fiber by gripping an individual fiber and gently pulling.

As for the rejection of **claim 38**, this claim has been deleted.

As for the rejection of **claim 39**, this claim has been narrowed to individually test traffic lights.

As for the rejection of **claim 40**, this claim has been amended to reflect energy storage integrated into the controller.

9) Please consider the above viewpoints in reconsidering the base claims.

Thank you for your further consideration.

Robert Marshall

Blount, Eric

From: bobmarshall@practical-technology.com

Sent: Monday, April 25, 2005 9:55 AM

To: Blount, Eric

Subject: 10/619,255 System and Method for Detecting a Structure Failure

Eric,

Sorry for the inconvience. You had provided a first office action on my application 10/619,255, System and Method for Detecting a Structure Failure, dated 1/10/05. I had responded to your first office action on 3/17/05. Unfortunately, it seems that my response was made into a new application, 11/082,247, instead of a response to your first OA.

Should I expressly abandon 10/082,247 and resend my response to your first OA on 10/619,255 (even though it is now more than 3 months from 1/10/05)? Or, will resending create more confusion?

Any assistance will be appreciated.

Thanks,
Robert Marshall
512-260-5396